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Myringoplasty with Mastoidectomy in Eustachian Tube Dysfunction

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Abstract

The debate over the role of mastoidectomy in improving the results of tympanoplasty is a long one. In a trial to determine the effectiveness of mastoidectomy in improving the effectiveness of mastoidectomy in improving the results of tympanoplasty by increasing the air cushion in the middle ear cavity, we performed myringoplasty in 60 patients with dry central perforation and with poor Eustachian Tube (ET) function. In 30 of them we combined mastoidectomy with myringoplasty, whereas in the other half we performed myringoplasty alone. We found that the overall results, as regards graft take, hearing and ET function improvement, were significantly better in those who had myringoplasty and mastoidectomy compared to those who had myringoplasty alone. Mastoidectomy seemed to be a safe and effective method to improve the results of myringoplasty.

Introduction

OTOLOGISTS have long recognized the association of reduced mastoid pneumatization and chronic middle ear infection.

Jackler in 1984 [1] proposed a number of mechanisms to explain the role of small mastoid air cell volume in chronic ear disease. He believed that the most important of these was the air reservoir theory that stated that the mastoid air cell system provided a pneumatic reservoir upon which the middle ear could draw during periods of Eustachian tube dysfunction. This mastoid air volume might slow or prevent the development of negative middle ear pressure associated with transient Eustachian tube obstruction.

The purpose of this work is to determine the effectiveness of mastoidectomy as regards improving the results of myringoplasty by increasing the air cushion in the middle ear cleft.

Material and Methods

In this study, we screened patients with chronic suppurative ottitis media attending the ENT outpatient clinic, Cairo University Hospital. We chose 60 patients fulfilling the following criteria:

- Dry central perforation for at least 6 months.
- Poor Eustachian tube function.
- No gross nasal pathology that may affect Eustachian function.

Eustachian function was evaluated using Inflation Deflation test [2]. We used the manometric portion of the tympanometry. With an airtight seal and the probe tip in the external ear canal, a pressure of -200 mm H_2O was built up. The patient was then asked to swallow 4 times with 10 seconds interval and with open nose The air pressure changes were recorded after each swallow. The same procedure was repeated with building up of positive pressure of 200 mm H_2O.

According to the results obtained, we categorized Eustachian function as:

- Good, when the tube could equalize applied -ve and +v pressure as recorded to less than 100 mm H_2O.
- Bad, if there was no change of both positive and negative pressure.

We performed pure tone audiometry (air and bone conduction with masking for frequencies 500, 1000, 2000 and 4000Hz) using diagnostic audiometer Interacoustics model AD17 and excluded cases with sensorineural hearing loss.

The patients were divided into 2 groups randomly, each consisted of 30 patients.

Group I, myringoplasty with mastoidectomy.

Group II, myringoplasty without mastoidectomy.

In both groups ossicular chain and Eustachian orifice were checked intraoperatively to exclude cases due to ossicular chain defect or tympanic orifice stenosis, or sclerosis.

The patients were followed up for a period ranging from 1-2 years and were subjected to:

- Clinical examination for healing and take of the graft and also the mobility of the tympanic membrane.
- Audiometry and tympanometry.

Results

The sample was composed of 35 males and 25 females. Their ages ranged from 17 to 26 years, with mean age of 21.5 years.

Postoperative follow up showed that Group I had an over all better success rate as regards graft take, hearing improvement and Eustachian tube function compared to group II.

A- Group I:

1- Hearing threshold: the average hearing threshold before surgery was 42.8 db while after surgery it was 32 db. There was a significant difference between both as $p < 0.0001$.

2- Graft take: 28 patients had good graft take (93.3%). 24 of them had improved hearing whereas 6 did not show any improvement.

3- Eustachian tube function: 26 patients had improved ET function. Out of them 21 had improved hearing (80.8%) and 5 had bad hearing results (19.2%). They had no graft failure.

On the other hand, only 4 had poor function (13.3%). One of them had improved hearing and 3 had bad hearing results. Two of them had graft failure.

B- Group II:

1- Hearing results: The average hearing

threshold before surgery was 38.8 db while after surgery it was 33 db with significant difference ($p = 0.0001$).

2- Graft take: 22 patients had good graft take (73.3%). 16 of them had improved hearing (72.7%) whereas 6 had poor hearing results (27.3%).

3- Eustachian tube function: 20 patients had improved ET function (66.6%). Out of them 15 patients had improved hearing (75%) and 5 had bad hearing results (25%). Only 2 patients (10%) out of the 20 patients had graft failure. On the other hand, 10 patients had poor ET function (33.4%), 3 with improved hearing while 7 had bad hearing results and only 4 of them (40%) had good graft take.

Table (1) shows that in group I, 28 patients (93.3) had good graft take while in Group II only 22 patients had good results (73.3).

While in group I, 24 patients with good graft take had improved hearing (85.7%), we found that only 16 patients in group II had good hearing results (72.7%) (Table2).

Table (3) shows that 26 patients had improved ET function (86.7%) in group I while in group II, 20 patients only had good ET function.

In group I, 21 patients had improved hearing with good ET function, compared to 15 in group II (Table 4).

Also in group I, 26 patients with good graft take had good ET function (92.8%) compared to 18 patients (81.2%) in group II (Table 5).

Table (1): Graft Take or Failure in both Groups.

Graft	Group I		Group II	
	No.	%	No.	%
Success	28	93.3	22	73.3
Failure	2	6.7	8	26.7
Total	30	100	30	100

Table (2): Relation between Improved Hearing and Graft Take in both Groups.

Hearing	Group I		Group II	
	No.	%	No.	%
Improved	24	85.7	16	72.7
Not Imoroved	4	14.3	6	27.3
Total	28	100	24	100

Table (3): % of ET Function in both Groups.

ET Function	Group I		Group II	
	No.	%	No.	%
Good	26	86.7	20	66.7
Bad	4	13.3	10	33.3
Total	30	100	30	100

Table (4): Relation between Hearing Improvement and ET Function.

ET Function	Group I		Group II	
	No.	%	No.	%
Good	21	80.8	15	75
Bad	5	19.2	5	25
Total	26	100	20	100

Table (5): Relation between Graft Take and ET Function.

ET Function	Group I		Group II	
	No.	%	No.	%
Good	26	92.8	18	81.2
Bad	2	7.2	4	18.8
Total	28	100	22	100

Table (6): Amount of Average Hearing Improvement.

Average hearing improvement	Group I	Group II
Pre-Op.	45.2 db	41.5 db
Post-Op.	34.2 db	32.3 db

$p < 0.05$

Table (7): % of Change in Hearing Average Post-operatively.

Group	% change in hearing average	SD
I	-23.7975	13.801
II	-21.577	17.402

$p = 0.048$

Discussion

We found that patients in group I (myringoplasty and mastoidectomy) had, in general better results compared to group II (myringoplasty without mastoidectomy).

As graft take, we found that it was 93.3% in group I and 73.3 in group II. The difference was statistically significant ($p < 0.05$).

Our results matched those of Jackler [3] who had 86.6% success rate in cases of myringoplasty with mastoidectomy. He stated that mastoidectomy was safe and effective adjunctant to myringoplasty and this was especially true in cases with previous failed myringoplasty. Also Reimer in 1988 [4] found that ears with small air filled volume had significant lower healing rate than ears with large air filled volume. This supported the idea that increase in air filled cavity increased the rate of graft take.

On the other hand Okubo [5] mentioned that gas emission from the middle ear cavity in the atmospheric environment and a low Oxygen tension were a natural physiologic mechanism to protect the middle ear cavity from infection and other hazards. This suggested that increase in air filled cavity may increase the risk of subsequent otitis media.

Nearly all failed ears had small anterior dry reperforation which functioned much as a tympanostomy tube providing middle ear ventilation. This suggested that severe ET dysfunction was the most common cause of failure.

All our cases had pre-operative poor ET function. We had 76.6% improvement post-operatively (86.6% in group I and 66.6% in group II). This indicated that most cases of pre-operative ET dysfunction were reversible and improved with surgery.

We found that 95.6% of ears with good post-operative ET function had successful graft take while only 42.8% of ears with poor post-operative ET function healed successfully which reflected the impor-

tance of ET function for good graft take. Our results agreed with those of Holmquist [6] and Cohn et al. [7]. They suggested that good ET function correlated well with successful graft take. Also they matched those of Jonathan [8] and Sato [9] who found that in all those patients where poor preoperative function ended with successful grafting post-operative tubal function reverted to normal.

Although the results of graft take with poor post-operative ET function were low and nearly the same in group I (50%) and in group II (40%). The rate of ET function improvement in group I was significantly higher than that of group II (86.7% in group I compared to 66.7% in group II) (Table 3). This showed the importance of mastoidectomy in improving ET function which was crucial for graft take. This might explain why the rate of graft take was higher in group I.

Another and possibly an important role of mastoidectomy in tympanic membrane repair was its effect on hearing results. In our study we found that although hearing improvement was significant in both groups (Table 6), there was a significant difference between group I and group II (Table 7).

The results agreed with Wehrs [10] and Jackler [1]. They found that the degree of hearing gain was dependent on mastoid size and that aeration of the mastoidectomy cavity was important to achieve good hearing results following myringoplasty. This suggested that the surgical creation of an aerated mastoid cavity with enlargement of the aditus-ad-antrum may be acoustically beneficial.

From the above data we concluded that a well pneumatized mastoid and the air reservoir that it represented, might mitigate against the development of detrimental middle ear negative pressure. Obviously in the total absence of ET function, no amount of air reservoir will prevent the ultimate development of severely negative middle ear pressure and consequently a middle ear disease.

However, mastoid size becomes clinically important in ears with partial or intermittent ET dysfunction. In this situation a complex balance exists between middle ear gas absorption and ET ventilation which may subject the ear to prolonged periods of air volume loss which can be compensated for by the mastoid reservoir.

With these problems in mind, we now combine simple mastoidectomy with myringoplasty in selected cases of chronic otitis media especially in those with ET dysfunction hoping to surgically create an air reservior and to eradicate sequestrated mastoid disease [1].

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